Moda/TSDA Series Driver

User's Manual(V1.1)

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Correction record

Version	Record
V1.1	Correct 4 Alarm code error code14 description
	Correct 2.2 CN1 connector pin14,15,16,17 description

Contents

1. Introduction....4

1.1 Unpacking....4
1.2 Relocation....4
1.3 Safety precautions....5
1.4 Installation....5
1.5 Dimensions....6
1.6 Specification....8

2. System wiring....10

2.1 Unit overview....10
2.2 CN1 connector....11
2.3 CN2 encoder connector....15
2.4 Position mode....16
2.5 Speed mode....17
2.6 Torque mode....18
2.7 Power and motor diagram....19
2.8 RS232....20

3. Panel operation....24

3.1 Mode selection：....24
3.2 Auxiliary functions....25
3.3 User Parameters....34
3.4 Monitor mode....40

4. Alarm code....43

1. Introduction

Thank you for choosing Moda/TSDA series AC servo Drivers. Moda/TSDA series Drivers use the latest servo technology to provide high-precision and versatile functions for driving TED CB,MB and CC series servo motors. Many safety related features have been built in the Driver design. However, erroneous operation may result in unpredictable accident and cause damage to the Driver or severe personal injury. It is highly recommended that the user is familiar with this manual and performs all setup and operations with caution.

This manual provides the information you need to install and configure Moda/TSDA series Driver. This manual is intended for use by vendors who are responsible for installing and setting up Moda/TSDA series Driver; consequently, it assumes a basic working knowledge of SINANO AC servo Motors.

In this manual, the installation related information such as **Dimensions and Specifications** are described in Chapter 1.

Wiring information is shown in Chapter 2.

Procedures for **Panel Operation** are described in Chapter 3.

Finally, the **Alarm Codes** are given in Chapter 4.

1.1 Unpacking

After receiving the shipment from your supplier, please verify the following:

1. The motor (s) and driver(s) are the same as ordered.
2. The capacity of the driver matches with the motor to be driven.
   (Please see the Driver Specification for correct driver.)
3. No damage to the packaging material occurred during transportation.

1.2 Relocation

Please use the original packaging for driver relocation and handle with care.

1.3 Safety precautions

1. Many high volume capacitors are used in the Driver circuit; these capacitors remain charged even if the unit power is been shut off. If it is necessary to touch the terminal or open the driver chassis, **please wait at least 10 minutes** before continuing.
2. While power on the Driver and/or motor, stand clear from the unit to prevent personal injury caused from erroneous operation.
3. Disconnect the power if the Driver/Motor unit is not used for a prolonged period.
4. To prevent electric leakage, connect the motor ground to the FG terminal of the Driver and connect this FG to Class 3 grounding. The machine, which the Driver and motor are installed must be single-point grounded.

1.4 Installation

1. **Location**
   (1) If installed in a confined chassis, please provide necessary ventilation system to maintain the environmental temperature of the Driver below **55℃**.
   (2) Use rubber pad or shock absorber to insulate vibration if there is vibrating equipment nearby.
   (3) The Driver shall not be installed in an environment where corrosive gases, excess dust, or metal power is present. Insulation from water, water mist, or cutting fluid is required.
   (4) If there is a big magnet switch or welding equipment, which may generate electronic noise, near the Driver installation, then a line filter is required.
   Recommend filter:
   For single-phase power source: DELTA 06DPCW5
   For three-phase power source: DELTA 08TDS4W4
   (5) If a line filter is not allowed for the reason of excess leakage current, then a insulating transformer is required at the input of the Driver.

2. **Orientation**
   The Driver must be installed vertically.

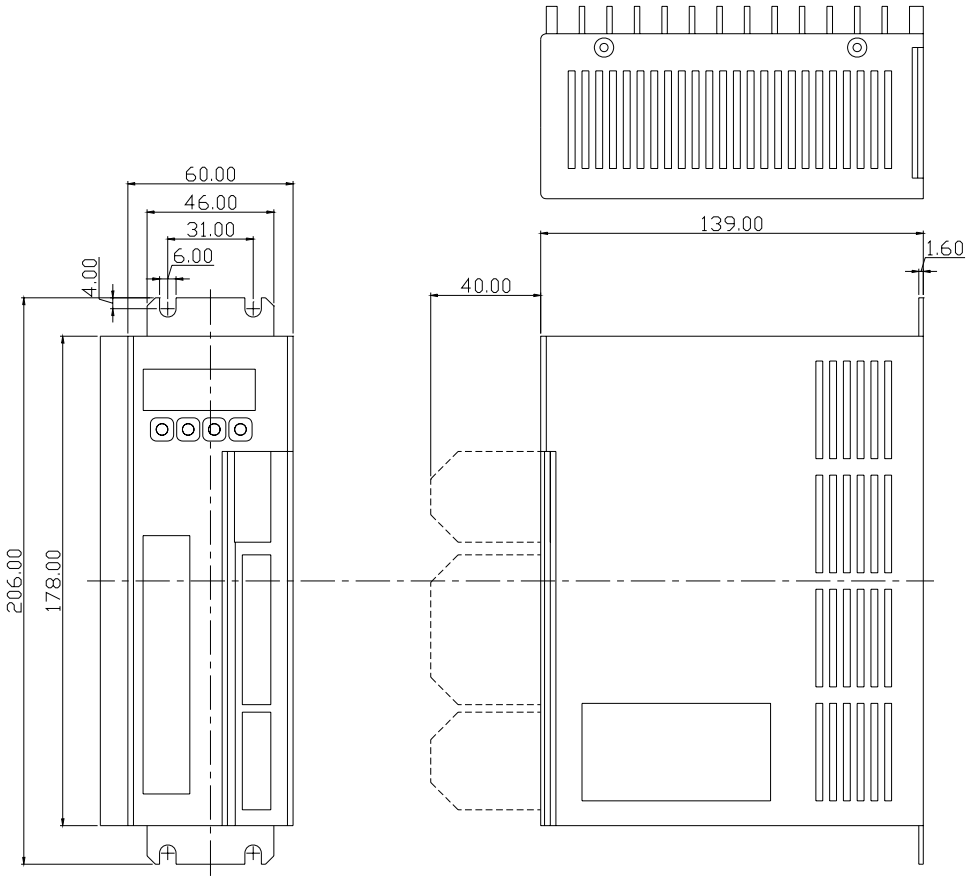
3. **Mounting Screw**
   Use **four (4) M5 screws** to mount the Driver securely.

4. **Spacing**
   Maintain **at lease 2 cm** spacing around the Driver unit.

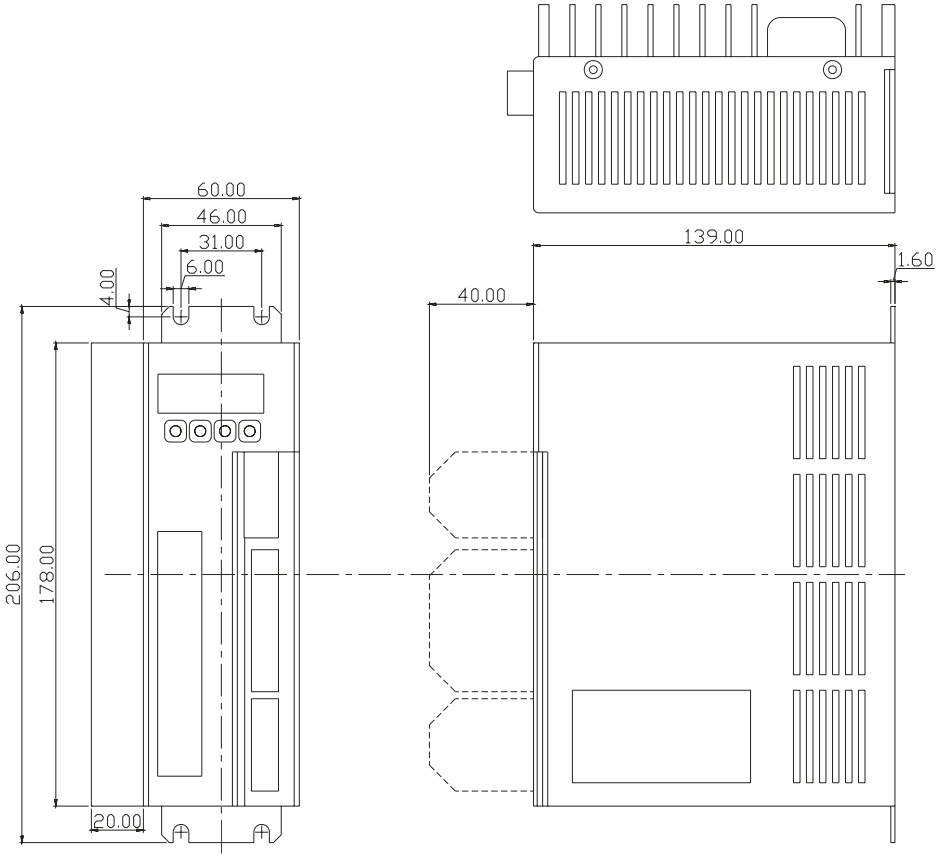
5. Foreign objects
   During and after installation, any foreign object such as cutting chips, small screw, or washer which may fall into the opening of the Driver unit must be prevented.

1.5 Dimensions

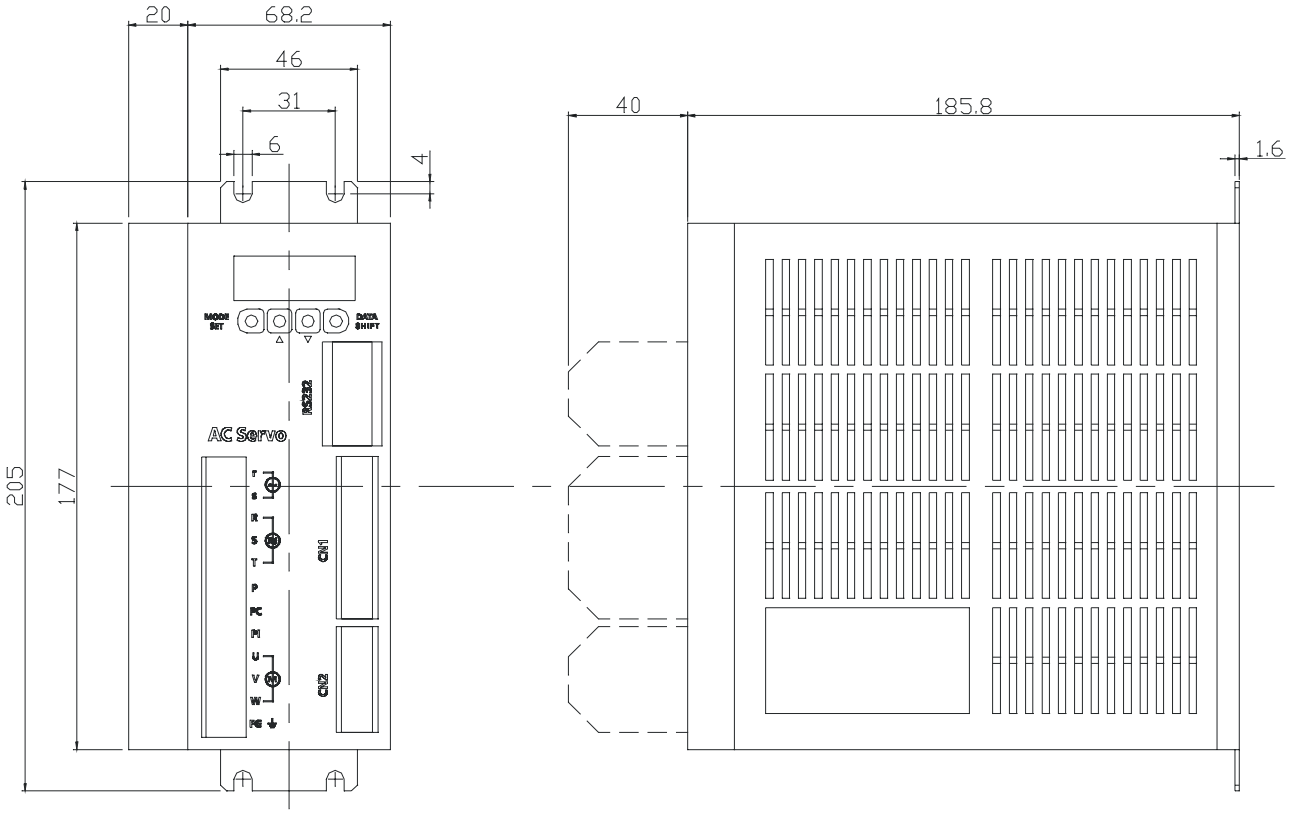
Model TSDA15:



Model TSDA20



Model TSDA30



1.6 Specification

General Specification:

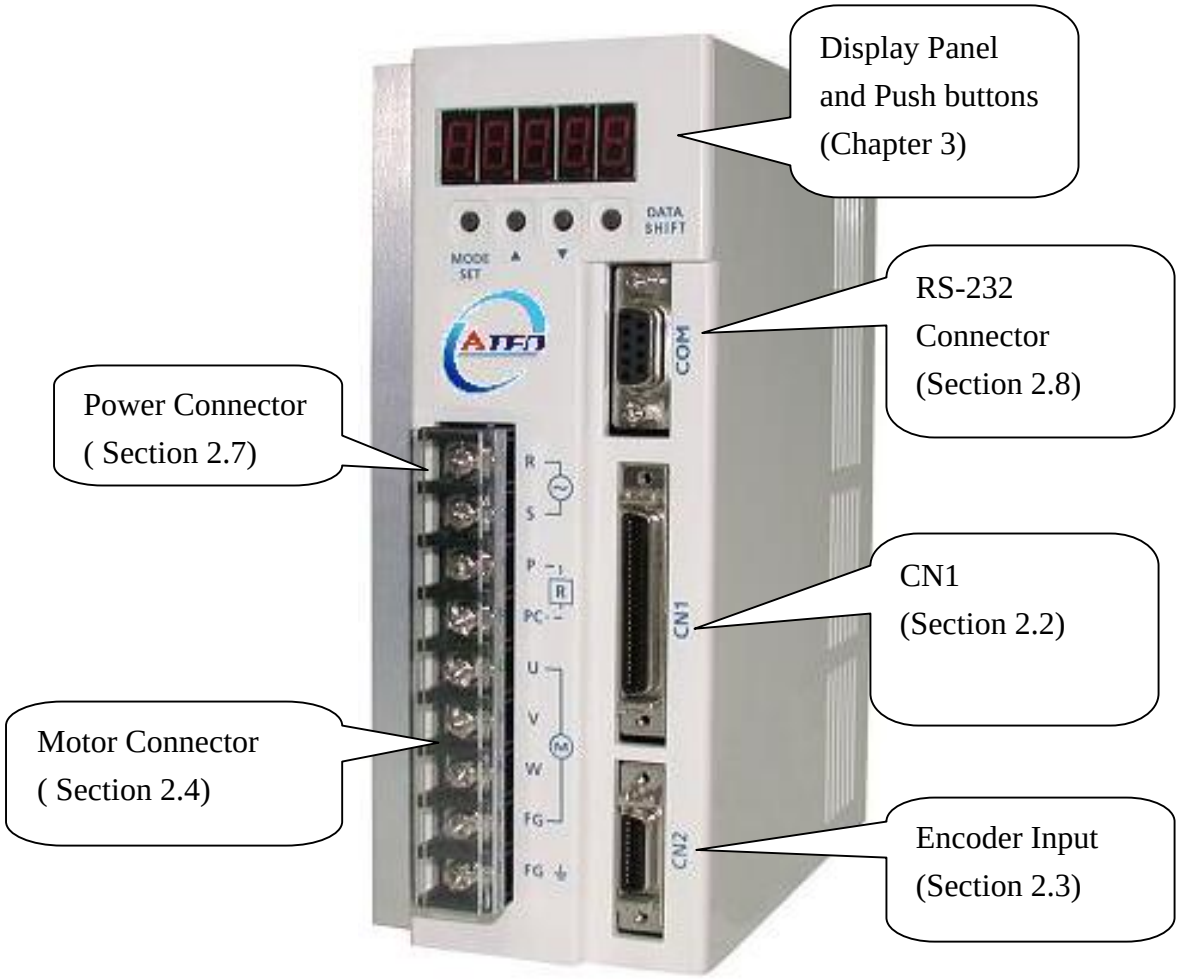
Driver		Description										
Model No.		TSDA15				TSDA20				TSDA30		
Motor Series		B			C	B		C		C	B	
Motor Model No.		5CB12	7CB20	7CB30	6CC201	8CB50	8CB75	6CC401	8CC751	8CC102	3MB100A	3MB100B
Rated RPM		3000	3000	3000	3000	3000	3000	3000	3000	3000	1000	2000
Rated Phase Current (A)		2.2	2.8	2	1.8	3	3.4	3.5	4.4	5.6	5.16	5.16
Maximum Peak Current (A)		6.6	8.4	6	5.6	9	10.2	11.1	13.8	16.9	15.5	15.5
Encoder		Incremental type										
Control		Sine Wave										
Power	Main	AC110V +10% ~ -15% Single-Phase 50 / 60 Hz			AC220V +10% ~ -15% Single/Three-Phase 50 / 60 Hz					AC220V +10% ~ -15% Single/Three-Phase 50 / 60 Hz		
	Control									AC220V +10% ~ -15% Single-Phase 50 / 60 Hz		
Environment	Temperature	Operation: 0 ~ 50°C Storage: -20 ~ 80°C										
	Humidity	Operation/Storage: < 85% RH										
	Vibration	< 0.5G										
Manual Operation		May be defined by User's Parameter										
Error Message		10 error messages are stored.										
Over-Travel inhibit		Positive or Negative Over-Travel inhibit (If over-travel is occurred, the servo power may be disabled or put on hold.)										
Emergency Stop		Servo driver is OFF if Emergency Stop (D/I) is ON.										
Analog Monitoring Output		Speed and Torque (-10V ~ 10V)										
Status Display		D/I and D/O and Unit status										
Encoder Output		A, B, C Phase line driver output										
Encoder Ratio		1/N: N=1 ~ 16										
Regeneration		Built-in										
Protection		Voltage, Current, Load, Speed; Encoder, memory malfunction										
Display		5-digit LED display										
D/I		Servo ON, Reset, Reverse Inhibit, Control Mode, External Torque Limit Emergency Stop, Pulse Input Inhibit, etc.										
D/O		Servo Ready, Error, In Position, Zero Speed, Encoder Output										
Communication		RS-232C for User's Parameter setting and status monitoring										

Control Mode

Control Mode			Position / Speed / Torque
Position	Input type		A-B phase, Up-Down pulse, or direction pulse
	Max. Input Freq.		500kpps
	Electronic Gear Ratio		1/127≦A/B≦127 (A&B:1 ~ 10000)
	Input Ripple Filtering		Time Constant = 0 ~ 10000ms
	In position range		0 ~ 32767 Pulses
Speed	Input		0 ~ ±10V (Looking at the motor shaft, +V = CCW)
	Preset		Three preset speeds available through defining User's Parameter
	Speed Variation Rate		Less than 0.03%, when load changes from 0% to 100%. Less than 0.02%, when power source voltage changes from –10% to +10%. Less than 0.05%, when operation temperature changes from 0°C to 50°C.
	Linear Acceleration/ Deceleration		Enable/Disable: may be defined by User's Parameter When enabled, the time constant may be defined by User's Parameter between 20ms ~ 10000ms
	Zero Speed determination		0 ~ 255rpm
	Specified speed reached		Specified by User's Parameter, 0 ~ Rated Speed
	Servo Lock		Enable/Disable: may be defined by User's Parameter
	Internal Torque		0 ~ 300% rated torque
Torque	Input		0 ~ ±10V (Positive voltage for positive torque)
	Input Ripple Filtering		Time Constant: 0 ~ 10000ms
	Speed Limit	External	0 ~ 10V (Rated Speed)
		Internal	0 ~ Rated Speed

2. System wiring

2.1 Unit overview



2.2 CN1 connector

<table>
<tr><th>Pin no</th><th>Name</th><th>Symbol</th><th>I/O*</th><th>Mode</th><th>Function</th></tr>
<tr><td>1</td><td>Servo on</td><td>SON</td><td>Di-1</td><td>A</td><td>SON connects to DG means servo on or servo system ready, open circuit means servo off.</td></tr>
<tr><td>2</td><td>Alarm reset</td><td>ALRS</td><td>Di-1</td><td>A</td><td>If ALRS is short to DG, then the alarm signal is cleared. However, the alarm persists if the reason, which caused the alarm, is not resolved.</td></tr>
<tr><td>3</td><td>P/PI switch</td><td>PCNT</td><td>Di-1</td><td>PS</td><td>Connect to DG will switch the control mode from proportional + integration mode to pure proportional mode</td></tr>
<tr><td>4</td><td>CCW inhibit</td><td>FSTP</td><td>Di-1</td><td rowspan="2">A</td><td>Connect to a CW over-travel sensor/switch/detector.
(Normally closed contact)</td></tr>
<tr><td>5</td><td>CW inhibit</td><td>RSTP</td><td>Di-1</td><td>Connect to a CW over-travel sensor/switch/detector.
(Normally closed contact)</td></tr>
<tr><td rowspan="2">6</td><td>External torque limit</td><td rowspan="2">TLMT</td><td rowspan="2">Di-1</td><td>PS</td><td>Connect this signal to DG will limit the torque output in the range of NIC to PIC.</td></tr>
<tr><td>External speed limit</td><td>T</td><td>Connect this signal to DG will limit the motor speed below the speed read from PIC(pin27)</td></tr>
<tr><td rowspan="2">7</td><td>Clear error counter</td><td>CLR</td><td rowspan="2">Di-1</td><td>P</td><td>Clear error counter</td></tr>
<tr><td>Servo lock</td><td>LOK</td><td>S</td><td>Lock the last position if speed command is lower than 23 RPM.</td></tr>
<tr><td>8</td><td>Reserved</td><td></td><td></td><td></td><td>(Do not use.)</td></tr>
<tr><td>9</td><td>Emergency stop</td><td>EMC</td><td>Di-1</td><td>A</td><td>Servo off if EMC connect to DG</td></tr>
<tr><td rowspan="5">10
11</td><td rowspan="5">Internal speed 1
Internal speed 2</td><td rowspan="5">SPD1
SPD2</td><td rowspan="5">Di-1</td><td rowspan="5">ST</td><td>SPD1</td><td>SPD2</td><td>Speed mode</td><td>Torque mode</td></tr>
<tr><td>0</td><td>0</td><td>SIN(pin26)</td><td>PIC(pin27)</td></tr>
<tr><td>1</td><td>0</td><td>Internal speed 1</td><td>Speed limit 1</td></tr>
<tr><td>0</td><td>1</td><td>Internal speed 2</td><td>Speed limit 2</td></tr>
<tr><td>1</td><td>1</td><td>Internal speed 3</td><td>Speed limit 3</td></tr>
<tr><td>12</td><td>Control mode</td><td>MDC</td><td>Di-1</td><td>A</td><td colspan="4">Effective only in PN 12-4 is 1
Please refer to PN10-1</td></tr>
<tr><td>13</td><td>Command pulse inhibit</td><td>INH</td><td>Di-1</td><td>P</td><td colspan="4">Ignore the input command pulses.</td></tr>
<tr><td>14</td><td>Pulse +</td><td>PP</td><td rowspan="3">Di-2</td><td rowspan="4">P</td><td rowspan="4">Input pulse.

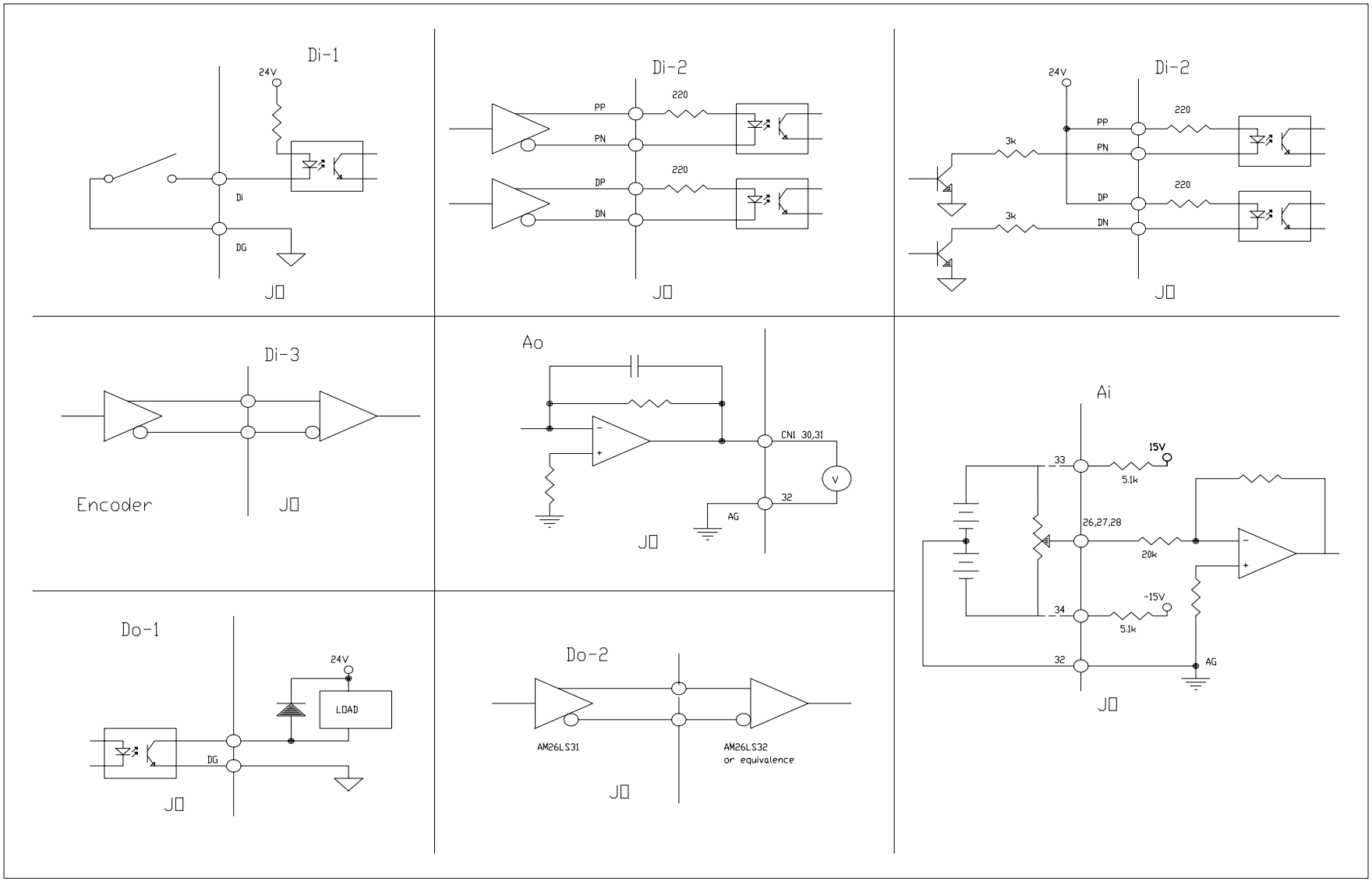
(The type is set by PN10-2)</td><td>PN10-2 value</td><td>Pin 14,15</td><td>Pin 16,17</td></tr>
<tr><td>15</td><td>Pulse -</td><td>/PN</td><td>0</td><td>Pulse</td><td>Direction</td></tr>
<tr><td>16</td><td>Direction +</td><td>DP</td><td rowspan="2">Di-2</td><td>1</td><td>CW</td><td>CCW</td></tr>
<tr><td>17</td><td>Direction -</td><td>/DN</td><td>2</td><td>Phase A</td><td>Phase B</td></tr>
<tr><td>18</td><td>Servo ready</td><td>REDY</td><td>Do-1</td><td>A</td><td colspan="4">Power source is in normal condition and no alarm, REDY connects to DG.</td></tr>
<tr><td>19</td><td>alarm</td><td>ALM</td><td>Do-1</td><td>A</td><td colspan="4">ALM connects to DG normally; it is open when any abnormal condition is detected.</td></tr>
</table>

Pin no	Name	Symbol	I/O*	Mode	Function
20	Zero speed	ZS	Do-1	S	ZSP out, ZSP connects to DG if PN11-4 is 0 and the motor speed lower than the speed set in PN7.
	Brake	BI		S	This signal is used as a control signal for external brake if PN11-4 is 1. BI connects to DG to release the brake at servo on, and open at servo off. The timing can be adjusted by the value set in PN32.
21	In position	INP	Do-1	P	When the pulses difference between the command pulses and the feedback pulses is less than the value set in the PN20. The INP signal turns ON (INP connects to DG).
	Speed reached	INS		S	When the motor speed exceed the RPM value set in PN8, the INS signal turns ON (INS connects to DG).
22	alarm bit 0		Do-1	PS	Binary representation of the alarm codes. The alarm code output from these ports is the same as the code shown on the 7-segment display.
23	alarm bit 1				
24	alarm bit 2				
25	alarm bit 3				
26	Speed /torque command	SIN	Ai	ST	A +10V to –10V speed-command input or torque-command input. PN3 is used to scale the input value. If the rated speed is 3000RPM and PN3 is 8 that means a 8 V speed command is interpreted as a 3000 rpm speed command. PN10-3 is used to change the direction, please refer to PN10-3for details.
27	Speed limit	PIC	Ai	T	External speed limit input, 10V gives a speed limit the same as rated speed
	CCW torque limit			PS	0~10V External torque limit. 10V-voltage input gives a 3 times rated torque limit in positive direction.
28	CW torque limit	NIC	Ai	PS	0~-10V External torque limit,-10V-voltage input gives a 3 time rated torque limit in negative direction.
30	Speed monitor	TG	Ao	PS	±10V represent ±4500rpm, offset can be adjusted from PN34.
31	Torque monitor	CUR	Ao	PS	±10V represent ±3.5 times of rated torque output. The offset can be adjusted from PN35.
29	Analog ground	AG	Ao	PS	Analog ground
32					
33	Voltage out	+15		S	±15V DC 10mA MAX. power source for SIN, PIC, NIC test
34		-15			
35	Encoder phase A output	PA	D0-2	PS	Encoder input pulses after frequency division (PN0) is output by line driver. When PN10-3 is 1, the motor rotation direction is CCW, phase A lead by 90 degree.
36		/PA			
37	Encoder phase B output	PB			
38		/PB			

Pin no	Name	Symbol	I/O*	Mode	Function
39	Encoder phase Z output	PZ			Transfer the Z phase of the encoder input signal.
40		/PZ			
41	Reserved				(Do not use)
42	Reserved				(Do not use)
43	Encoder phase Z output	Zo	D0-1	PS	An open collector output for encoder phase Z
44	Encoder ground	EG		PS	Encoder ground
45	+24Vdc External input	+24V			External +24V power supply input
46	Digital ground	DG		PS	Ground for digital input and output ports.
47					
48					
49					
50	Shielding	FG		PS	Connect to the shielding of the cable

* ‘P’ means for position mode, ‘S’ means for speed mode, ‘T’ means for torque mode, ‘A’ means for all modes in mode column.

*Di—1~3 are input pins, Do—1~2 are output pins, Ai and Ao are analog input and analog output respectively. All the circuits are listed in the following charts.

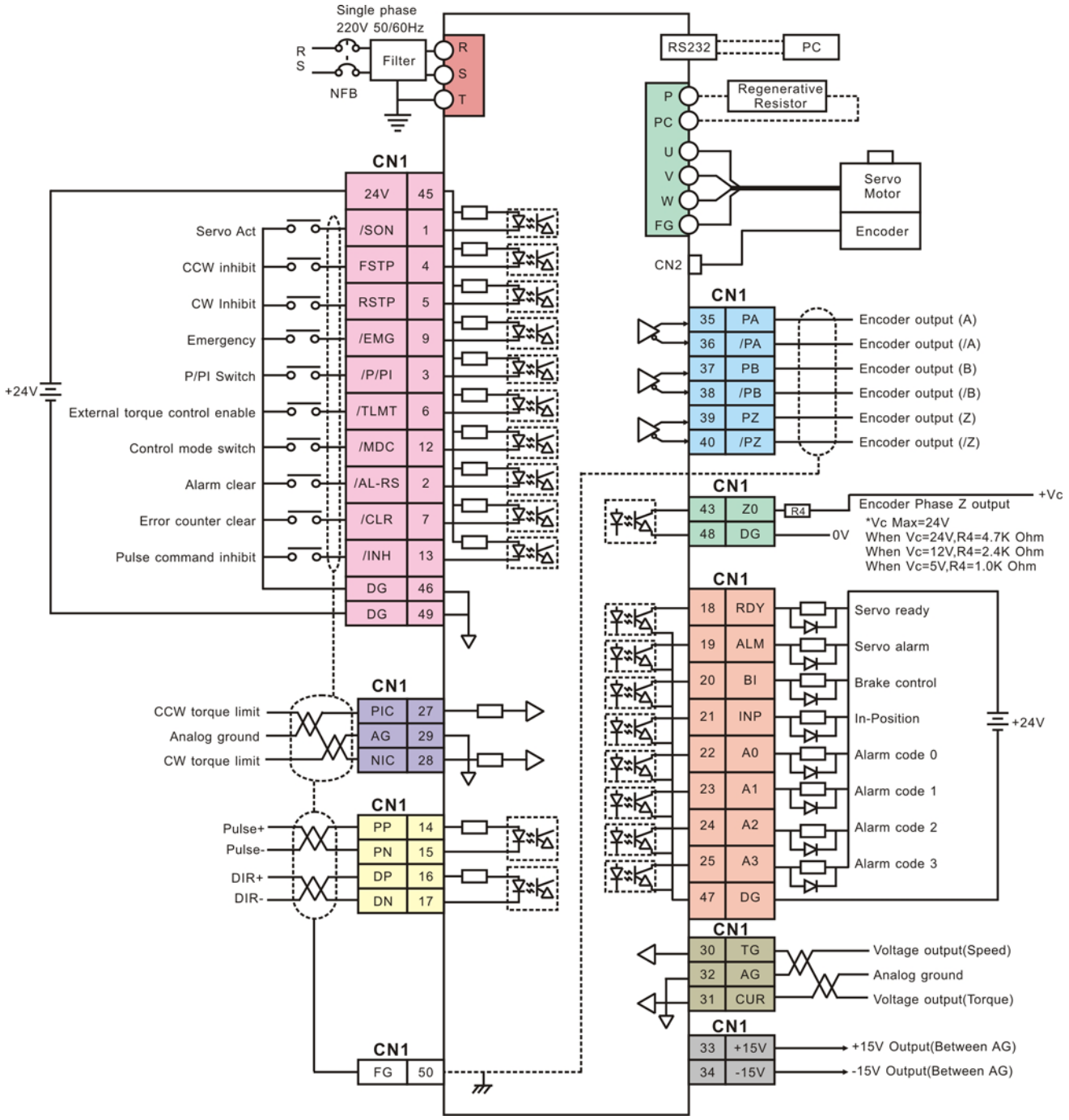

Di-1
24V
Di
DG
J□
Di-2
PP
PN
DP
DN
220
J□
Di-2
24V
3k
PP
PN
DP
DN
220
J□
Di-3
Encoder
J□
Ao
CN1 30,31
32
AG
V
J□
Ai
15V
33
5.1k
26,27,28
20k
-15V
34
32
AG
J□
Do-1
24V
LOAD
DG
J□
Do-2
AM26LS31
AM26LS32
or equivalence
J□

2.3 CN2 encoder connector

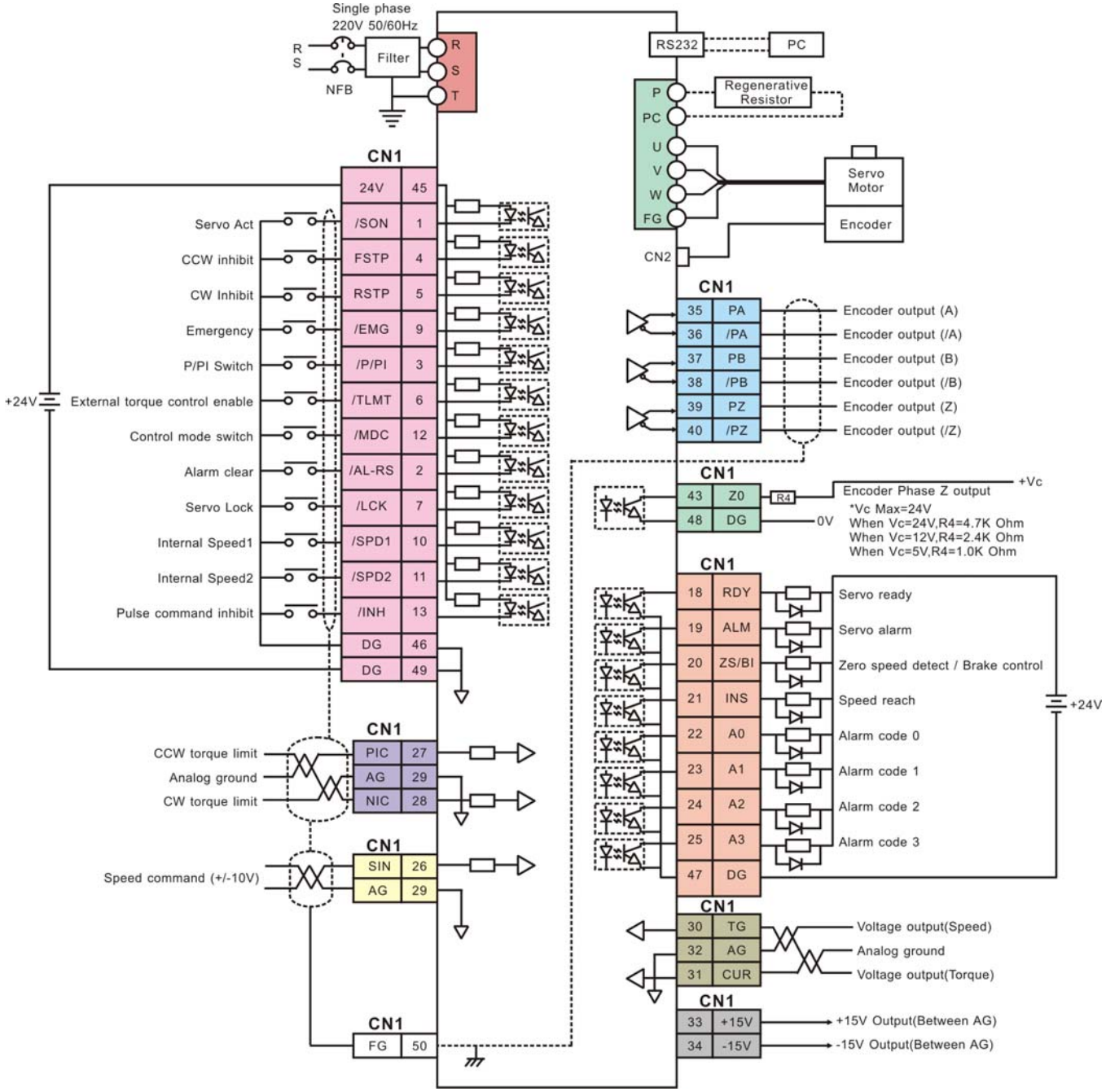
Pin no	Name	Symbol	I/0*	Encoder		Function
				Wire color	Terminal	
1,2	5V	+5V		white	B	If the wire length for the encoder is longer than 20m, please use double wire to minimize voltage drop. If the wire is longer than 30m, please consult with your supplier for recommended wire gage.
3,4	0V	0V		black	I	
5	A	A	Di-3	green	A	Encoder phase A
6	/A	/A		blue	C	Encoder phase /A
7	B	B	Di-3	red	H	Encoder phase B
8	/B	/B		peach	D	Encoder phase /B
9	Z	Z	Di-3	yellow	G	Encoder phase Z
10	/Z	/Z		orange	E	Encoder phase /Z
11~19	Reserved					Not used.
20	Shielding	FG		shielding	F	Connect to the shielding of cable.

* Note: Please see the chart shown on Page 12 for Di-3 characteristics.

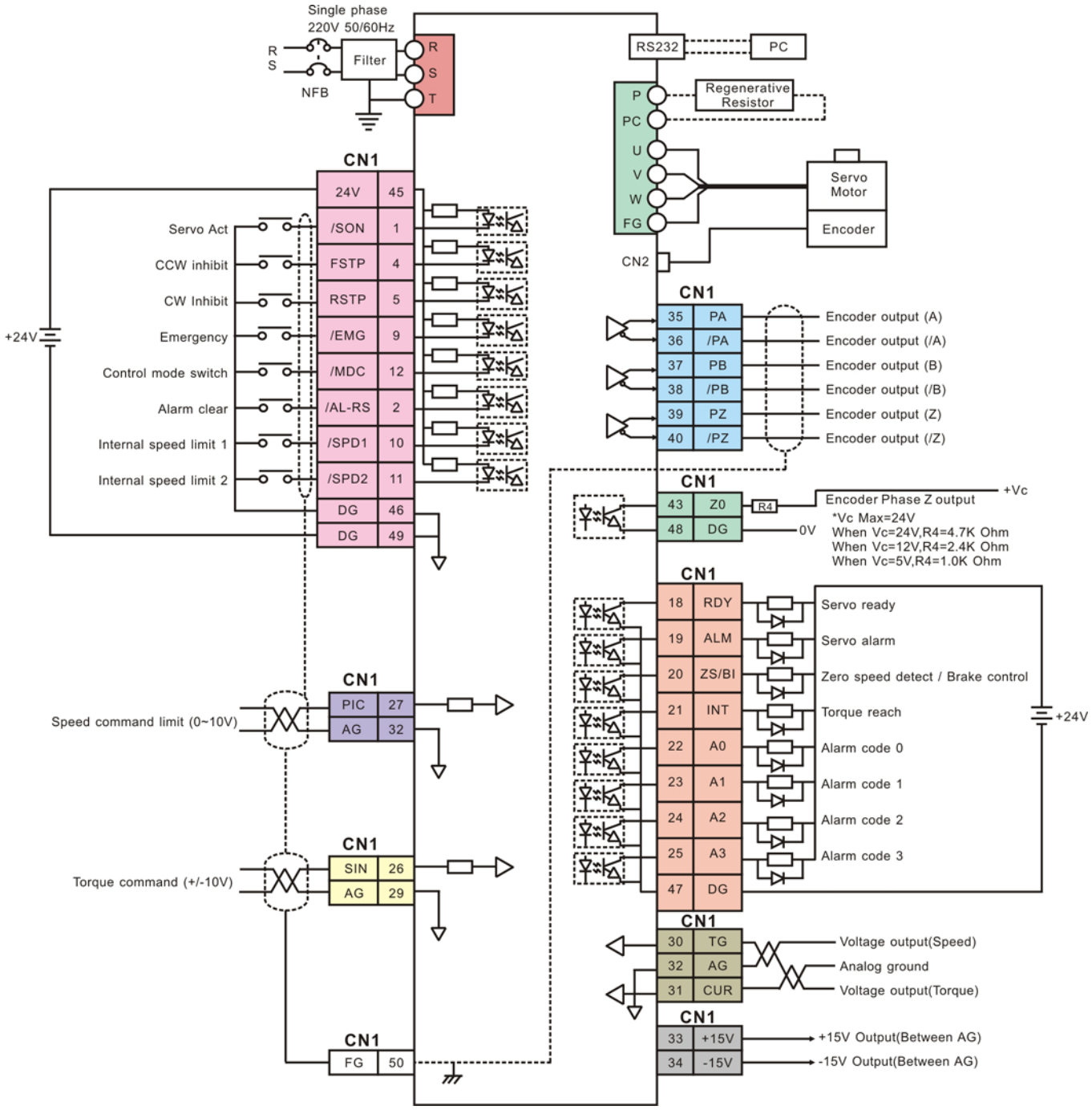
2.4 Position mode



2.5 Speed mode

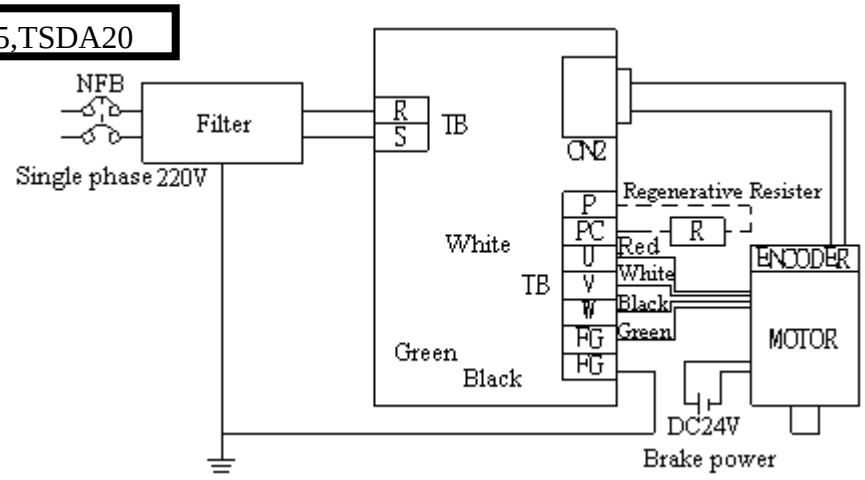


2.6 Torque mode

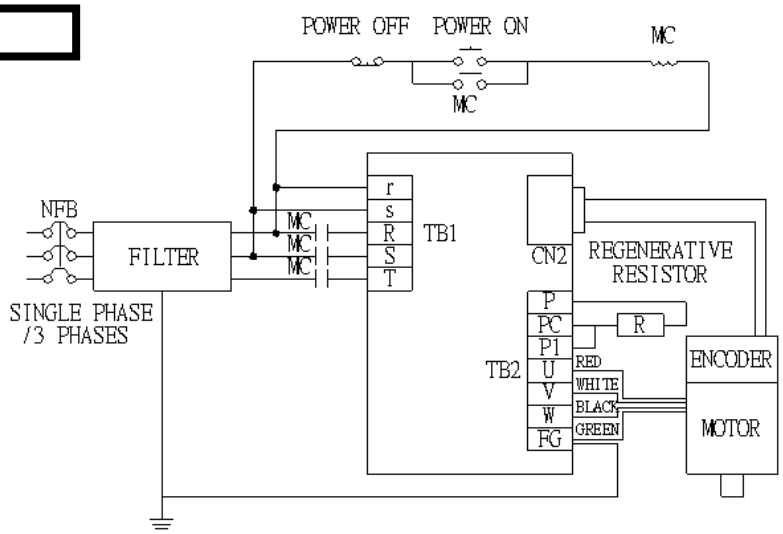


2.7 Power and motor diagram

TSDA15,TSDA20



TSDA30



Recommended line filter:

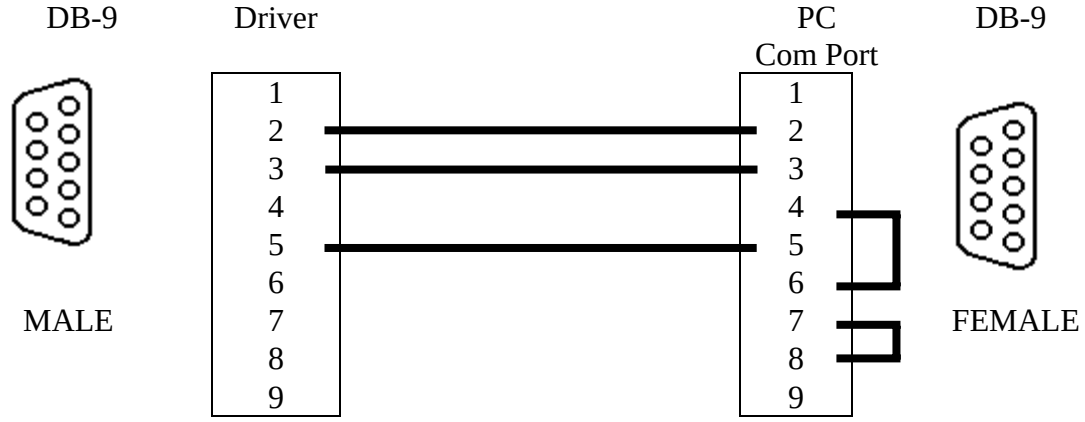
Three-phase: DELTA 08TDS4W4

Single-phase: DELTA 06DPCW5

Regenerative Resister:

When the inertia presented on the motor is heavy, a regenerative resister is required. The value of the resister may be obtained by dividing the wattage of the motor from 2500. For example, a 50Ω resister may be used for a 50W motor. If “error02” (Chapter4) persists, then adjusting the regeneration duty cycle (Pn040, Section 3.3) is also required. Select suitable wattage for the resistor, forced cooling (by fan) may be required for proper heat dissipation.

2.8 RS232



Please use the cable described above to connect the servo-driver to a PC for retrieving the system data and setting up the operation parameter.

2.8.1 PC Communication port setting

Baud rate: **9600** bps

Parity: **None**

Data bit: **8**

Stop bit: **1**

Flow Control: **None**

2.8.2 Read data from driver

◎To read a **SINGLE-WORD** from driver

Syntax：**R5XxSs** The read command must be started with “R5” and the command string length must be “6”.

Where: R5: This is a single-word read command.

Xx = the address of the data to be read.

Ss = Check Sum = ’R’+’5’+’X’+’x’

Example：

Read the data stored in 30H.

Check Sum = 52H + 35H + 33H + 30H = EAH

R 5 3 0

Thus, the reading command is “R530EA”：R(52H)、5(35H)、3(33H)、0(30H)、E(45H)、A(41H).

◎ Drive’s response: **%XxYySs**

Where: %: This is a response.

Xx = High word of data

Yy = Low word of data

Ss = Check Sum = ’%’+’X’+’x’+’Y’+’y’

If the data stored in the address 30H is 0008H, then

Check Sum = 25H + 30H + 30H + 30H + 38H = EDH

% 0 0 0 8

Thus, the reiver's response is " %0008ED"：%(25H)、0(30H)、0(30H)、0(30H)、8(38H)、E(45H)、D(44H).

If there is a Check Sum error in the read command, then the driver returns "! (21H)"

◎To read a **DOUBLE-WORD** from driver

Syntax：**L5NnSs** The read command must be started with "L5" and the command string length must be "6".

Where: L5: This is a double-word read command.

Nn = the address of the data to be read.

Ss = Check Sum = 'L'+'5'+'N'+'n'

◎Driver's response: **%XxYyAaBbSs**

Where: %: This is a response.

XxYy = data stored in Nn+1

AaBb = data stored in Nn

Ss='%'+'X'+'x'+'Y'+'y+'A'+'a'+'B'+'b'

If there is a Check Sum error in the read command, then the driver returns "! (21H)"

2.8.3 Write data to driver

◎To write a **SINGLE-WORD** to driver

Syntax：**W5XxYyZzSs** The write command must be started with "W5" and the command string length must be "8".

Where: W5: This is a single-word write command.

Xx = the address of the data to be written.

Yy = The high word of the data

Zz = The low word of the data

Ss = 'W'+'5'+'X'+'x'+'Y'+'y'+'Z'+'z'

Example: Write "8" to address "30H".

Check Sum=57H+35H+33H+30H+30H+30H+30H+38H=1B7H

W 5 3 0 0 0 0 8

Thus, the write command is W5300008B7: W(57H)、5(35H)、3(33H)、0(30H)、0(30H)、0(30H)、0(30H)、8(38H)、B(42H)、7(37H)

Please note that only the last two digits of the Check Sum are used.

◎ Driver's response: **%(25H)**

If there is a Check Sum error in the read command, then the driver returns "! (21H)"

For Monitor Mode Address 128(80H) ~ 157(9DH), the data sent to the driver is the number of times, which the driver will respond with the content stored in the specified address. For example: Sending a string of "W5800008BC" will cause the driver to respond with the content stored in address 80H for **eight times.** The format of the response string is the same as "R5" read command. This function can be used to monitor a certain data such as speed or torque continuously. Writing a "zero" to one of these addresses will clear the content store at that address.

◎To write a **DOUBLE-WORD** to driver

Syntax：**M5NnXxYyAaBbSs** The write command must be started with "M5" and the command string length must be "14".

Where: M5: This is a double-word write command.
Nn = the address of the data to be written.
Xx = The high word of the data to stored in Nn+1
Yy = The Low word of the data to stored in Nn+1
Aa = The high word of the data to stored in Nn
Bb = The Low word of the data to stored in Nn
Ss = 'M'+'5'+'N'+'n'+'X'+'x'+'Y'+'y'+'A'+'a'+'B'+'b'

◎ Driver's response: **%(25H)**

If there is a Check Sum error in the read command, then the driver returns "! (21H)"

For Monitor Mode Address 128(80H) ~ 157(9DH), the data sent to the driver is the number of times, which the driver will respond with the content stored in the specified address. For example: Sending a string of "M58000080008Ss" will cause the driver to respond with the content stored in address 81H and 80H for **eight times.** The format of the response string is the same as "L5" read command. This function can be used to monitor a double-word data such as accumulated pulses continuously. Writing a "zero" to one of these addresses will clear the content store at that address.

2.8.4 Memory map

Address	Descriptions
0~9	Historical Alarm Codes (NO.0~NO.9)
10	Address of the last Alarm (0~9)
11	User Parameter Check Sum (NO.0~NO.51, XOR)
12~63	User Parameter (NO.0~NO.51), Read/Write, unsigned.
64~79	Reserved for USER as the motor model
80~93	Reserved
94	Backup copy of Addr11
95~127	Default values for User Parameters (NO.32~NO.0)
128~147	Monitor Mode (NO.0~NO.19), Read only, signed.
148~157	Monitor Mode Data Area. See Section 2.8.3 for detailed information.
158~191	Reserved
192(C0H)	1. Address 11 is the check sum of Address 12~63. Any value change in Address 12~63 will cause Address 11 to be changed accordingly. 2. Writing a “0” to this address (192) will disable the updating function of the Address 11. Writing a “1” to this address (192) will enable the updating function. The system default is “enable”. 3. During the “disable” state, writing any value to Address 11 will cause the Check Sum to be regenerated. 4. If there are many User Parameters need to be changed, disabling the Check-Sum updating function is highly recommended to prevent excessive writing of EEPROM. After changing all the User Parameters, a write operation to Address 11 may then be executed.
193(C1H)	Clear historical Alarm codes, the contents in Address 0~10are cleared.
194(C2H)	Writing a “1” to this address will initialize the driver with the setting stored in the address 12 ~63; the block, where a user is not allow to change, is excluded.
195(C3H)	Firmware version, the format is similar to that of Fn003. For the numbering of year, 0 ~ 9 stands for Year2000~2009; A ~Z stands for Year 2010 ~ 2035, respectively.
196(C4H)	RESET
197(C5H)	Input Status, the description of each bit is shown in Section 3.2.6.
198(C6H)	Output Status, the description of each bit is shown in Section 3.2.7.
199(C7H)	Current Alarm code, “0” means no alarm.

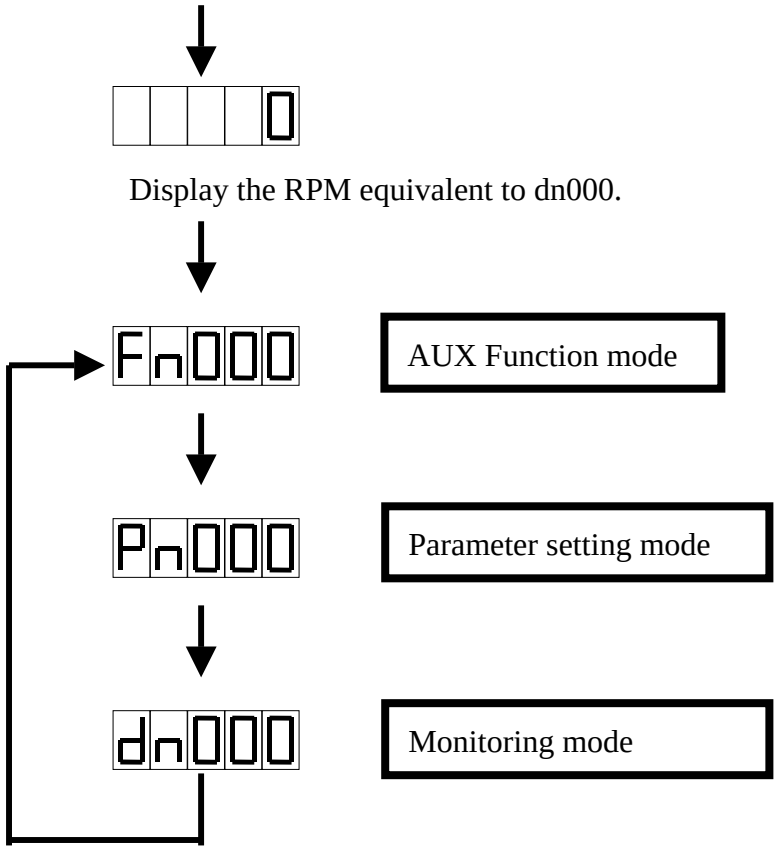
3. Panel operation

Name	Function
MODE	Mode selection, press this key for more than 1 second to confirm the flashing function
▲	Increase the flashing digit by 1
▼	Decease the flashing digit by 1 • press ▲ and ▼simultaneously to clear the alarm
DATA	Shift the cursor (the flashing digit) left by 1 position. Press this key for more than 1 second to select or store the data into the EEPROM (PN)

3.1 Mode selection：

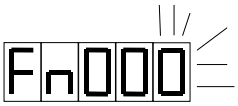
There are 3 modes to select from: Auxiliary function, Parameter setting, and Monitoring. Press the MODE key repeatedly to cause the displays to scroll in the following sequence:

Power on



3.2 Auxiliary functions

Press the MODE key repeatedly until the following pattern is displayed.

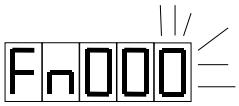


3.2.1 Historical alarm code

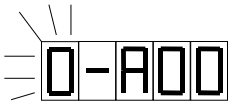
The last 10 alarm codes are stored in the EEPROM.

Use the following procedures to retrieve the stored alarm codes.

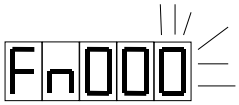
1. Select the auxiliary function mode.



2. Press the DATA key for more than 1 second.

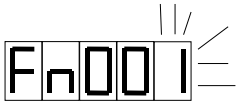


3. Press the ▲ key or the ▼ key to scroll up and down among the previous alarm codes. The leftmost number is the alarm sequence, where “9” means the oldest.
4. Press the DATA key for more than 1 second to return to the auxiliary function mode.

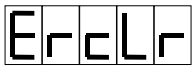


3.2.2 Clear the historical alarm codes

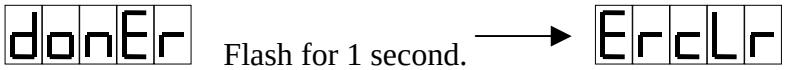
1.Press the ▲ key or the ▼ key to select function 1.



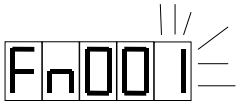
2. Press the DATA key for more than 1 second until the following message appears.



3. Press the MODE key to clear the memory.



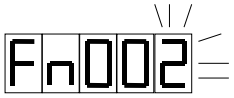
4. Press the DATA key more than 1 second to return to the auxiliary function mode.



3.2.3 Jog

Jog uses the speed specified in the PN29 and the acceleration time specified in the PN28.

1. Press the ▲ key or the ▼ key to select the jog function ‘Fn002’.



2. Press the DATA key for more than 1 second.

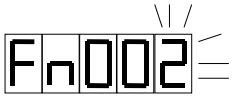
3. Press the ▲ key or the ▼ key to jog in positive or negative direction.

Jog in positive direction.

Jog in negative direction.

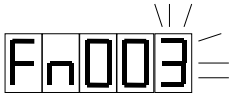
Hold.

4. Press the DATA key for more than 1 second to return to the auxiliary function mode and close the jog function.

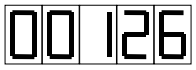


3.2.4 Firmware version

1. Press the ▲ key or the ▼ key to select the function 3.



2. Press the DATA key for more than 1 second to display the firmware release date：

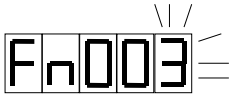


represents the date: 26 JAN 2000

Counting from left to right, the first and second digit represents YEAR. The third digit represents the month. 1、2、3、4、5、6、7、8、9、A、b、C represent JAN to DEC respectively. The figures are shown as following:

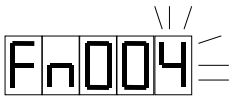
The fourth and fifth digit represents the Date.

4. Press the DATA key for more than 1 second to return to the auxiliary function mode.



3.2.5 Reset – Warm start

1. Press the ▲ key or the ▼ key to select the function 4.



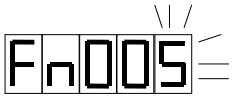
2. Press the DATA key for more than 1 second, and the following pattern is displayed.

3.Press the MODE key to confirm the reset，Press the DATA key for more than 1 second to abort the reset.

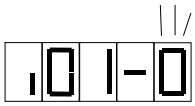
3.2.6 Input ports status

PIN number	Bit number	definition
1	9	Servo on
2	10	Alarm reset
3	2	P/PI
4	3	CCW inhibit
5	4	CW inhibit
6	5	External torque limit
7	1	Clear error counter
8	11	Reserve
9	8	Emergence stop
10	6	Internal speed 1
11	7	Internal speed 2
12	0	Control mode
13	12	Pulse command inhibit

1. Press the ▲ key or the ▼ key to select the function 5.



2. Press the DATA key for more than 1 second, The displays will show the pin number in left 3 characters and show the status in rightmost digit. ***If the status digit is 1, which means the pin is connected to DG or 0V or close.***
   If the status digit is 0, which means the pin is connected to 24V or open.

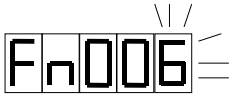


3. Press the ▲ key or the ▼ key to scroll up and down to view all the input ports.
4. Press the DATA key for more than 1 second to return to the auxiliary function mode.

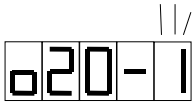
3.2.7 Output ports status

PIN number	Bit number	definition
18	3	Ready
19	0	Alarm
20	1	Zero speed
21	2	In Position
22	4	Alarm code bit0
23	5	Alarm code bit1
24	6	Alarm code bit2
25	7	Alarm code bit3

1. Press the ▲ key or the ▼ key to select the function 6.



2. Press the DATA key for more than 1 second, then the display will show the pin number in the left 3 characters and show the status in rightmost digit. If the ***status digit is 1, which means the pin is connected to DG or 0V or close. If the status digit is 0, which means the pin connect to 24V or open***.



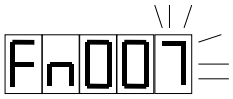
3. Press the ▲ key or the ▼ key to scroll up and down to view all output ports.
4. Press the DATA key for more than 1 second to return to the auxiliary function mode.

3.2.8 Scaling the positive speed input

This is a special function for final calibration. **Please don't perform this action without a precision Voltage generator.**

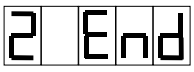
Procedure of this function: Fn010 → Fn007→Fn008.

1. Press the ▲ key or the ▼ key to select the function 7.

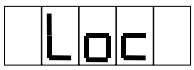


2. Press DATA for more than 1 second. The driver will ask you to present a 2-Volt signal in the speed reference input pin.

3. Press MODE key to indicate that a 2-volt signal is connected.

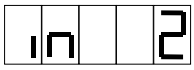
While scaling, 

is flashing.

This function is locked to prevent unintentionally activation. If this function was activated before unlocking, a 

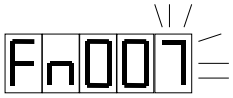
message is displayed.

If this function is done successfully, a

message flashes for 1 second before the confirmation. After confirmation, 

is displayed and indicating that the result has been written into the EEPROM.

4.Press the DATA key for more than 1 second to return to the auxiliary function mode.



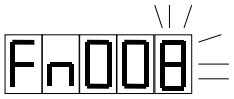
Unless a "donE" is displayed, the result is stored in the memory temporary to wait for negative data.

3.2.9 Scaling the negative speed input

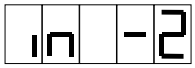
This is a special function for final calibration. **Please don't perform this action without a precision Voltage generator.**

Procedure of this function: Fn010 →Fn008→ Fn007.

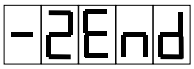
1. Press the ▲ key or the ▼ key to select the function 8.



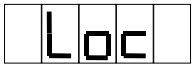
2. Press DATA for more than 1 second. The driver will ask you to prepare a -2-Volt signal in the speed reference input pin.



3. Press MODE key to indicate that a -2-volt signal is connected.

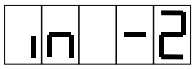
While scaling, 

is flashing.

This function is locked to prevent unintentionally activation. If this function was activated before unlocking, a 

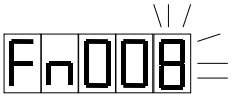
message is displayed.

If this function is done successfully,

message flashes for 1 second before the confirmation. After confirmation, 

is displayed and indicating that the result has been written into the EEPROM.

4. Press the DATA key for more than 1 second to return to the auxiliary function mode.



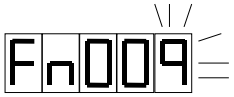
Unless a "donE" is displayed, the result is stored in the memory temporary to wait for positive data.

3.2.10 Reload the default values

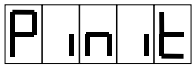
Function: reload the default values for Pn0 ~ Pn32

Procedure of this function: Fn010 → Fn009.

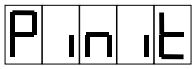
1. Press the ▲ key or the ▼ key to select the function 9.



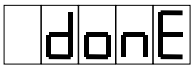
2.Press the DATA key for more than 1 second to request for a parameter initialization function.

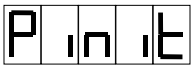


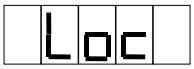
3.Press the MODE key to confirm the request.



flashes while reloading. ⟶

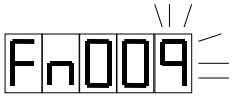


flashes for 1 second. ⟶ 

This function is locked to prevent unintentionally activation. If this function was activated before unlocking, a 

message is displayed.

4.Press the DATA key for more than 1 second to return to the auxiliary function mode.

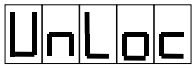


3.2.11 Lock & Unlock

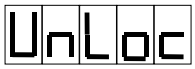
Functions 7, 8 and 9 are locked normally to prevent unintentionally activation. The following procedures can be used to unlock these functions.

1. Press the ▲ key or the ▼ key to select the function 10.

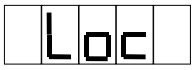
2.Press the DATA key for more than 1 second to request the unlock function.



3. Press the MODE key to confirm the request



flashes while unlocking.

Flash for 1 second. 

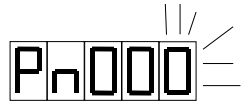
Press the MODE key again will lock the function again.

4.Press the DATA key for more than 1 second to return to the auxiliary function mode.

After unlocking, the function 9 or the function 7 and 8 can only executed 1 once. ***Function 7,8, and 9 will be locked after execution.***

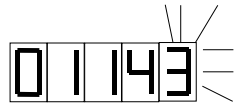
3.3 User Parameters

1. Press the MODE key repeatedly until PN000 is displayed.



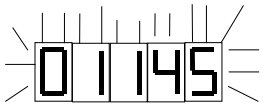
Press the ▲ key or the ▼ key to get the desired parameter number.

2. Press the DATA key for more than 1 second to retrieve the content of the listed parameter number.

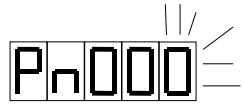


If there is a leading 'H', then it is a hexadecimal number.

3. To edit the number, press the DATA key to shift the flashing digit left. Press the ▲ key or the ▼ key to increase or decrease the flashing digit.
4. Press the DATA key for more than 1 second to store the new data into the EEPPROM. The number entered will flash for 1 second while recording.



5. Press the DATA key for more than 1 second to return to the parameter setting mode.



User Parameter Table

No.	Definition	Range	Unit	Default	Mode	effect	PC r/w address
0	PG dividing ratio	1~16		1	A	reset	12
1	Speed loop gain	5~500		40	A	enter	13
2	Speed loop integration time	1~1000	msec	100	A	enter	14
3	Speed scale. The motor speed at SIN pin = 10V .	200~ 30000	rpm	3000	S	reset	15
4	Speed reference offset	±63		0	S	reset	16
5	Positive torque limit	0~300	%	300	A	reset	17
6	Negative torque limit	0~300	%	300	A	reset	18
7	Zero speed detection. Under this speed, pin20 will be connected to DG. Also refer to Parameter 11-4, 12-2.	0~255	rpm	20	S	enter	19
8	Reach the specified speed. If the current speed is greater than the specified speed, pin21 will be connected to DG.	0~rated speed	rpm	Rated speed	S	enter	20
9	PWM sampling time	90~125	μs	100	A	reset	21
10-1	Hxxxn, n mode: 0 speed / speed; 1 position / position; 2 torque / torque; 3 speed / position; 4 position / torque; 5 torque / speed	0~5		1	A	reset	22-1
10-2	Hxxnx, n=0 sign + pulse, n=1 CW + CCW, n=2 AB phase pulse input.	0~2		1	P	reset	22-2
10-3	Hxnxx, n=0, CCW for positive command, n=1, CW for positive command.	0,1		0	A	reset	22-3
10-4	Hnxxx, n=0, current input calibrate automatically. n=1 set current input offset to 0 .	0,1		0	A	reset	22-4
11-1	Hxxxn,n=0, dynamic brake on while servo off. n=1, dynamic brake off while servo off. Dynamic brake always on while power off.	0,1		0	A	reset	23-1
11-2	Hxxnx, n=0, high-speed mode, increase the MAX speed by 10~20%. n=1, normal mode.	0,1		1	A	reset	23-2

No.	Definition	Range	Unit	Default	Mode	effect	PC r/w address
11-3	Hxnxx, External inhibit signal from input ports to enable or disable. n=0 disables ,n=1, enables positive inhibit signal. n=2 enable negative inhibit signal. n=3 inhibits both signals. Please refer to parameter 12-3 for more information.	0~3		3	A	reset	23-3
11-4	Hnxxx, n=0 output signal ‘zsp/bi’ means zero speed. n=1, output signal ZSP/BI is used to control an external brake.	0~1		0	A	reset	23-4
12-1	Hxxxn, acceleration and deceleration time for speed mode. n=0: time =0; n=1: linear acceleration. Acceleration and deceleration time is set in the parameter number 28. n=3: deceleration time is set in the parameter number 27 Acceleration time is set in the parameter number 28. n=4:Smoothing acceleration Acceleration and deceleration time is set in the parameter number 28.	0,1,3,4		1	S	reset	24-1
12-2	Hxxnx,n=0, speed command is not influenced by ZSP ouput. n=1 speed command is clamped to 0 while ZSP signal is on.	0,1		0	S	reset	24-2
12-3	Hxnxx,n=0 servo keeps on while external inhibit activated. n=1 servo off while external inhibit is activated. Please also refer to parameter number 11-3.	0,1		0	A	reset	24-3
12-4	Hnxxx, n=0 internal speeds not effective, n=1 internal speeds effective. One of the 3 internal speeds is select from input port. Speeds are defined in parameter 29~31.	0,1		1	S	reset	24-4
14	Torque command smoothing time	0~10000	ms	0	T	reset	26

No.	Definition	Range	Unit	Default	Mode	effect	PC r/w address
15	Torque command gain, e.g. 300 means 300% rated torque output when torque command is 10 Volts. 100 means 100% rated torque output when torque command is 10V.	30~3000	%	300	T	reset	27
16	Torque command offset, e.g. if offset is 100(1V), a 2.5V command from input port only executed as a 1.5V command.	-1000 ~+1000	0.01V	0	T	reset	28
17	Speed limit 1. Activated while the pin 10 of the CN1 short, and the pin 11 of the CN1 open.	0~rated speed	rpm	0	T	enter	29
18	Speed limit 2: activated while the pin 10 of the CN1 open, and the pin 11 of the CN1 short.	0~rated speed	Rpm	0	T	enter	30
19	Speed limit 3, activated whiles the pin 10 and the pin 11 of the CN1 are both short.	0~ rated speed	rpm	0	T	enter	31
20	In position, sets range of positioning completion signal output (INP).	0～ 32767	pulse	4	P	reset	32
21	Molecule of electronic gear ratio: indicates the number of encoder pulses per reference unit. The input pulses will multiply this number to form an actual calculation number. 0.02<(21)/(22)<50.	1～ 10000		1	P	reset	33
22	Denominator of electronic gear ratio: indicates the number of encoder pulses per reference unit. The input pulses will divide this number to form an actual calculation number. 0.02<(21)/(22)<50.	1～ 10000		1	P	reset	34
23	Position gain	10~500	1/sec	30	P	enter	35
24	Position smoothing time	0~10000	msec	10	P	Servo on	36
25	Error counter length	1~500	kpulse	50	P	reset	37
26	Feed forward gain	0~100	%	0	P	reset	38
27	Deceleration time: The time consumed from rated speed to stop. Parameter number 12-1 is used to disable or enable this function.	10~1000 0	msec	100	S	Servo on	39

No.	Definition	Range	Unit	Default	Mode	effect	PC r/w address
28	Acceleration time and deceleration time: The time consumed from still to rated speed or from rated speed to still. Parameter number 12-1 is used to disable or enable this function.	10~10000	msec	100	S	Servo on	40
29	Internal speed 1. Activated while the pin10 of the CN1 short, and the pin11 of the CN1 open.	±rated speed	rpm	0	S	enter	41
30	Internal speed 2: activated while the pin 10 of the CN1 open, and the pin 11 of the CN1 short.	±rated speed	rpm	0	S	enter	42
31	Internal speed 3: activated while both the pin10 and the pin 11 of the CN1 are short.	±rated speed	rpm	0	S	enter	43
32	Brake timing: Waiting time or delay time around servo on and servo off. Brake will be released before servo on, and hold after servo off if this constant is negative, servo on command will be postponed. Brake will be released after servo on, and hold before servo off if this constant is positive, servo off command is postponed.	±2000	msec	0	A	reset	44
34	Speed monitor offset	-10~+10	0.02V	0	A	enter	46
35	Torque monitor offset	-10~+10	0.02V	0	A	enter	37
36	Speed command offset	-199 ~ 199	0.02V	0	ST	reset	48
37	Speed command scale	10000 ~ 20000	1/16384	16384	ST	reset	49
38	Speed command offset (4 times precision)	-199 ~ 199	5mV	0	S	reset	50
39	Speed command scale (4 times precision)	10000 ~ 20000	1/16384	16384	S	reset	51

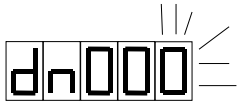
No.	Definition	Range	Unit	Default	Mode	effect	PC r/w address
40	Regeneration duty cycle, default value is 4. It means that if the voltage exceed 360V, there is 0.04-second regeneration in every 10 second. If there is error 2 exists, connect an external resistor, and observe the DN8, if the value of DN8 remains divergent, then this value need to be increased. The maximum value here is resistance of the resistor (Ω) times power dissipation (W) /134	0~250	0.1%	4	A	reset	52
41	Current loop gain	0～100		10	A	Reset	53
42	Inductance	0～300	%	200	A	Reset	54
43	Feed back gain	0～300		100	A	Reset	45
44	Reserved					PC	
45	Reserved					PC	
46	Reserved					PC	
47	Reserved					PC	
48	Reserved					PC	
49	Reserved					PC	
50	Reserved					PC	

Remarks:

1. Reset means the number is effective after reset from panel, CN1 or power off -on.
2. Enter means effective after value set.
3. PC means the value must be transfer in from the RS232 communication port.
4. Mode: A: effective for all control mode. P: effective in position mode only;
   S: effective in speed mode only; T: effective in torque mode only.
5. Default value of Pn0~Pn32 can be reload by function 9. Pn 33~ Pn 40 can be set from panel or from communication port. Pn41~Pn50 can only be set from the RS232 communication port.

3.4 Monitor mode

1. Press the MODE key repeatedly until the monitor mode is reached.



2. Press the ▲ key or the ▼ key to get the desired parameter number.
3. Press the DATA key for more than 1 second to display the content of the DN.
4. Press the DATA key again for more than 1 second to return to the monitor mode.

The monitor mode information list:

DN number	mode	definition	PC r/w address
0	PST	Revolutions (rpm), e.g. 120 means current motor revolution is 120 rpm, this value is the average rpm in 0.1 second.	128
1	PST	Torque: the value is the percentage of the rated torque of the motor. E.g. value 120 means that the current torque output is 120% of the rated torque of the motor.	129
2	PST	Actual load: the value is the average torque output percentage in 26 seconds.	130
3	PST	Maximum load: the value is the maximum value appeared in DN2	131
4	P	Error: the difference between command pulses and encoder feedback pulses. The command pulses are input pulse number multiply electronic gear ratio. The display value is clamped between –9999 ~ 9999.	132
5	S	PIC: torque limit for positive direction in percent.	133
6	S	NIC: torque limit for negative direction in percent.	134
7	T	PIC: speed limit in 1/4 rpm. A value of 4 indicates 1 rpm. A value of 12000 indicates 3000 rpm.	135
8	PST	Regeneration rate, 100 represents 1 %.	136
9	PST	Maximum regeneration rate, 100 represents 1 %.	137
10	PST	Maximum torque, the maximum torque output since power on.	138
11	PST	Driver capacity: 150 means 15A, 200 means 20A, 300 means 30A.	139
12	PST	Speed command, 4 means 1 rpm, 12000 means 3000 rpm.	140
13	ST	Voltage detected in AD0, 975 means 10V, 97 means 1V.	141
14	S	Voltage detected in AD1, 975 means 2.5V.	142
15	PST	Motor type, please refer to table at the end of this section.	143

DN number	mode	definition	PC r/w address
16	PST	Servo status. 0 means ‘servo on’, 1 means ’servo off’.	144
17	PST	Current control mode: 0 means speed mode, 1 means position mode, 2 means torque mode.	145
X	P	Low word of error counter, the 32 bit counter has a range from –500000 to 500000.	148
X	P	High word of error counter.	149
X	P	Low word of accumulated input pulse.	150
X	P	High word of accumulated input pulse.	151
X	P	Low word of accumulated encoder feedback pulses.	152
X	P	High word of accumulated encoder feedback pulses.	153
X	PST	RPM: 4 means 1RPM. E.g. 480 means current motor speed is 120 rpm, this is a sampled value in 1 of 50 samples taken in 10 milliseconds.	154
X	PST	Torque: output percentage of the rated torque. 120 means the torque output now is 120% of the rated torque. This is a sampled value in 1 of 50 samples taken in 10 milliseconds.	155

DN number X：these values can only be read/written via the RS232 communication port.

CB series motor’s ID list

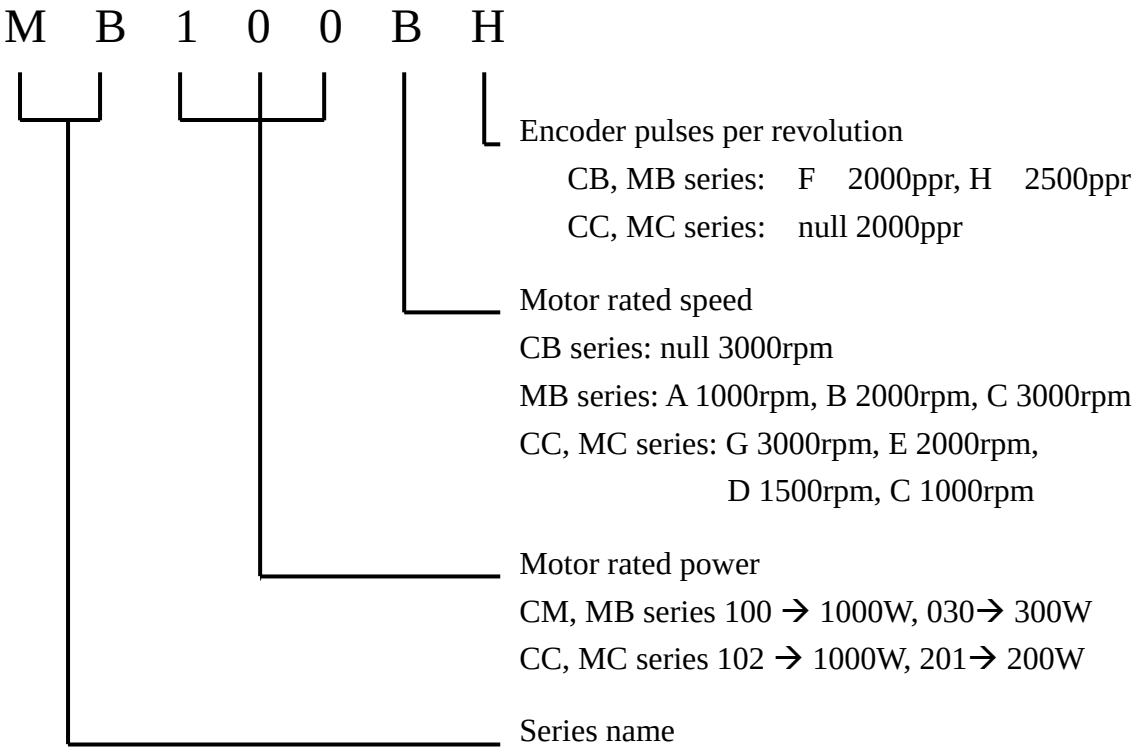
(If the ID less than 10, then the power sources is 110 VAC)

Motor type	ID	Motor type	ID	Motor type	ID
CB012F	110	CB020F	120	CB030F	130
CB050F	140	CB075F	150	CB075H	151
MB40AF	161	MB55AF	171	MB75AF	181
MB75BF	182	MB100AF	191	MB100BF	192
MB100BH	194	MB110CF	203	MB150AF	211
MB150BF	212	MB150CF	213	MB200BF	232
MB220CF	243	MB300BF	252	MB300CF	253

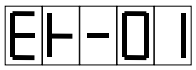
C series motor’s ID list

Motor type	ID	Motor type	ID	Motor type	ID
CC201G	300	CC401G	310	CC501E	321
CC501D	322	MC501C	323	CC751G	330
CC751E	331	MC751D	332	MC751C	333
CC102G	340	MC102E	341	MC102D	342
MC102C	343				

Motor type naming convention


M B 1 0 0 B H
Encoder pulses per revolution
CB, MB series: F 2000ppr, H 2500ppr
CC, MC series: null 2000ppr
Motor rated speed
CB series: null 3000rpm
MB series: A 1000rpm, B 2000rpm, C 3000rpm
CC, MC series: G 3000rpm, E 2000rpm,
D 1500rpm, C 1000rpm
Motor rated power
CM, MB series 100 → 1000W, 030→ 300W
CC, MC series 102 → 1000W, 201→ 200W
Series name

4. Alarm code

A message such as  indicating that an error has occurred. The message will stay until any key is pressed.

Error code	To remove	Definition
1	reset	Low voltage (DC voltage below 224V, or AC voltage below 160V, see note 1, 2).
2	reset	Over voltage (DC voltage over 390V, note 1,2), most of the case is happened on a large inertia. Please watch DN9 while running. If this value becomes bigger and never return to 0, please add an external resistor for regeneration. Please refer to PN40. The alarm also happens on high AC line voltage.
3	reset	Over load, a 200% rated load can last for about 10 seconds, a 300% load can last for about 4 seconds.
4	Power off	IPM error, due to high temperature, short-circuit, over current or low control voltage in IPM, the device which provides power to the motor.
5	reset	Encoder error, the signal from encoder is erroneous, please check connection or encoder.
6	reset	An abnormal value was read from the current sensors during power on.
7	reset	Parameter error— the electronic gear rate is not in the range (0.02~50).
8	reset	Parameter checksum error. The data stored in EEPROM may be corrupted.
9	reset	Emergency stop.
10	reset	1.Over current (300% rated current), please check the motor connection. Or, 2.Specify a longer acceleration/deceleration time.
11	reset	Error-counter overflow: (the difference of command pulses and feedback pulses is larger than the range of error-counter, which is defined in PN25.
12	reset	Over speed, the speed exceeds the value defined in the PN46.
13	reset	Peak input pulse exceeds 600kpps.
14	reset	Pin 4 and pin 5 of CN1 open simultaneously. Normally all these 2 pins must be connected to DG (pin46-pin49).
15	reset	Due to the setting in PN 12-3, one of the 2 over travel switches (pin3 and pin4) is activated and cause servo off.
16	reset	CPU error, watch dog time out.

Note 1: Due to the accuracy of the resistor, the voltage detected has a maximum of 2.02% difference.

Note 2: If the rated voltage of the motor is 100 V, the voltage level to alarm will be half of the value listed (DC112V for low voltage, DC195V for over voltage).

Note 3: There are 3 methods to reset the driver. Power cycle (Power off then on), Fn004, and send an input signal from pin2 of CN1. However, the cause of alarm must be resolved first.